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AERIAL PHOTOGRAPHIC ANALYSIS OF THE SHELL RIVERFRONT AND REFINERY SITES

Wood River, Illinois

by

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NOTICE

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ABSTRACT

This report presents single-date analysis of the Shell Riverfront and Shell Refinery sites located in Wood River, Illinois. Conventional color aerial photography acquired on April 8, 1986 was used to perform the analysis.

The 60-acre Shell Riverfront site is a transshipment facility for the adjacent refinery. Four settling basins were present at the site. No spills or seepage were visible.

Numerous potential contamination sources were observed at the 1790-acre Shell Refinery site. Unlined lagoons, landfills, sludge deposits and solid waste were visible at several points. Numerous spills, stains and pools of unidentified liquid were also noted.

The U.S. Environmental Protection Agency's Environmental Monitoring Systems Laboratory in Las Vegas, Nevada, prepared this report for the Agency's Environmental Services Division in Region 5 at Chicago, Illinois, and Office of Solid Waste in Washington, D.C. The report was prepared to document physical conditions at the sites.

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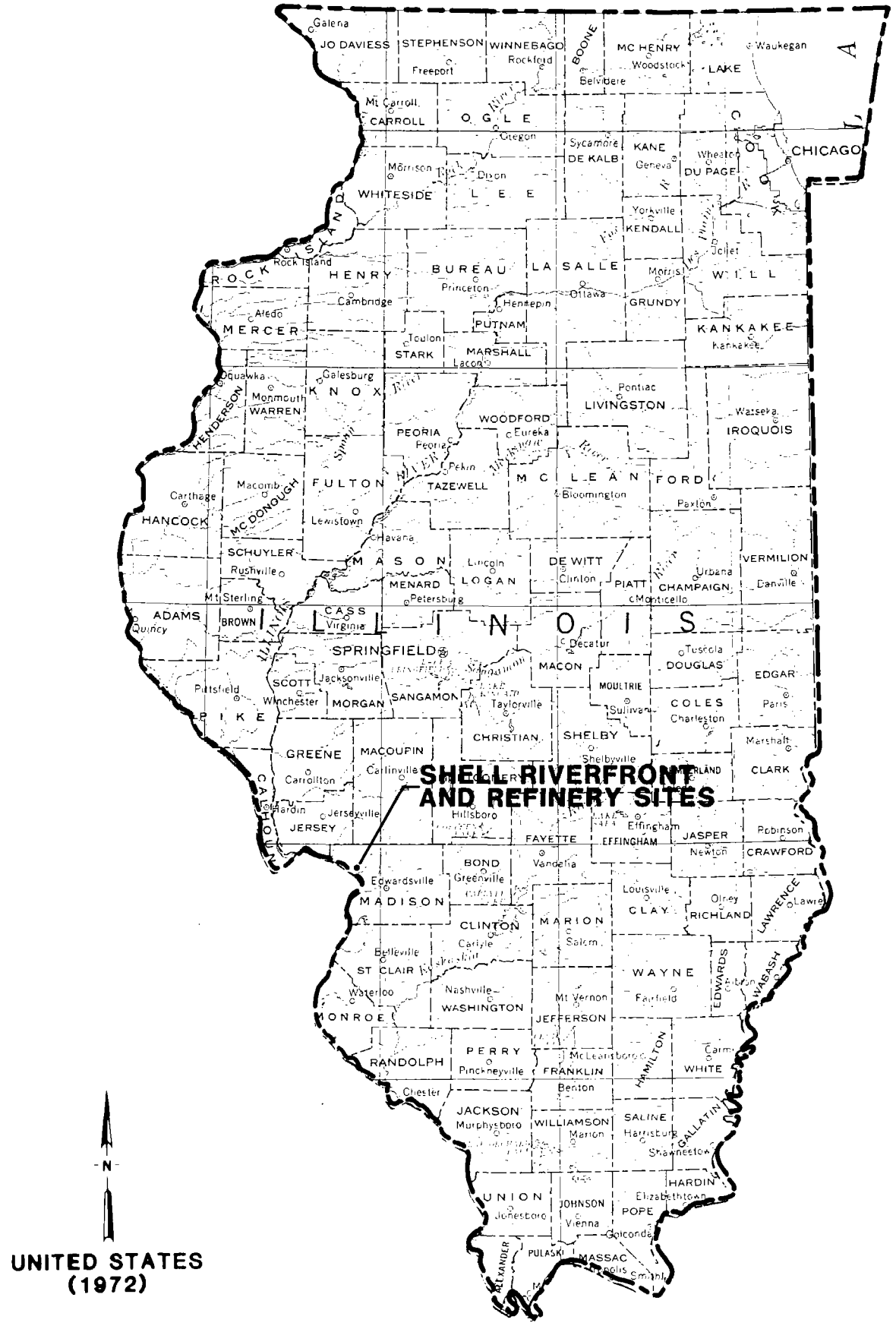

Figure 1. Site locations map, Illinois. Scale 1:2,800,000.

INTRODUCTION

This report presents a single-date analysis of the Shell Riverfront and Shell Refinery sites located on the Mississippi River southwest of Wood River, Illinois (Figure 1). The report was prepared to document physical conditions and potential environmental hazards at the sites. Conventional color aerial photography acquired on April 8, 1986 was used to perform the analysis.

The Shell Riverfront and Refinery sites are both petroleum and chemical facilities. The riverfront site is a transshipment point for products from the refinery and materials entering the site. The refinery site produces various chemicals including acetone, benzene, hydrogen, isopropyl alcohol, propylene, hydrocarbon solvents, and napthas.

The focus of the analysis at both sites was on possible threats to the local ground water; especially from drums, lagoons, and tanks. Scrap metal and sludges were reportedly buried at two landfills. Acids, caustics and asphalt were reportedly disposed of in impoundments. Oily tank bottoms, oil contaminated wastes and other unspecified chemicals have also been dumped at the site.

Background information on site conditions was provided by EPA Region 5 and obtained from the Directory of Chemical Producers, United States.

This report was produced by the U.S. Environmental Protection Agency's Environmental Monitoring Systems Laboratory in Las Vegas, Nevada, at the request of the Agency's Environmental Services Division in Region 5 at Chicago, Illinois and the Office of Solid Waste in Washington, D.C.

The following table lists all the Region 5 sites covered under this project.

TABLE 1. REGION 5 SITES COVERED UNDER TS-AMD-86612†

Report serial number†	Site name	Location	Analysis type
1	McCook Lead Supply	McCook, IL	Single-date
2	LaClede Steel	Alton, IL	Single-date
3	Union Refinery	Lemont, IL	Single-date
4	Shell Refinery ‡	Wood River, IL	Single-date
	Shell Riverfront ‡	Wood River, IL	Single-date
5	Amoco Refinery	Wood River, IL	Single-date
	Amoco Riverfront	Wood River, IL	Single-date
6	Marathon Oil Refinery	Robinson, IL	Single-date

†To identify individual reports, add the report serial number to the series number.

‡Sites covered in this report.

METHODOLOGY

Stereoscopic pairs of historical and current aerial photographs are used to perform the analysis. Stereo viewing enhances the interpretation because it allows the analyst to observe the vertical as well as horizontal spatial relationships of natural and cultural features. Stereoscopy is also an aid in distinguishing between various shapes, tones, textures, and colors that can be found within the study area.

Evidence of waste burial is a prime consideration when conducting a hazardous waste analysis. Leachate or seepage resulting from burial and dumping of hazardous materials might threaten existing surface or ground-water sources. Pools of unexplained liquid are routinely noted because they can indicate seepage from buried wastes that may enter drainage channels and allow contaminants to move off the site. An excellent indicator of how well hazardous materials are being handled at a site is the presence or absence of spills, spill stains, and vegetation damage. Trees and other forms of vegetation that exhibit a marked color difference from surrounding members of the same species are labeled "dead," "stressed," or "damaged" based upon the degree of noticeable variation. Vegetation is so labeled only after consideration of the season in which the photographs were acquired.

The U.S. Environmental Protection Agency's Statement of Procedures on Floodplain Management and Wetlands Protection (Executive Orders 11988 and 11990, respectively) requires EPA to determine if removal or remedial actions at hazardous waste sites will affect wetlands or flood plains and to avoid or minimize adverse impacts on those areas. To aid in compliance with these orders, significant wetland areas located within and adjacent to the sites have been identified and delineated. However, the sites have not been visited to verify the accuracy of wetland identification.

Drainage analysis determines the direction a spill or surface runoff would follow. Direction of drainage is determined from analysis of the photographs and from U.S. Geological Survey topographic maps. Whenever they are available, 7.5-minute quadrangle maps (scale 1:24,000) are used to show site location and to provide geographic and topographic information.

Results of the analysis are shown on annotated overlays attached to the photos. The prints in this report have been enlarged when appropriate to show maximum detail. The following table provides specifications of the photographs used in this report.

TABLE 2. DOCUMENTATION OF AERIAL PHOTOGRAPHY

Site name, location, and geographic coordinates	Figure	Date of acquisition	Original scale	Film type†	Photo source‡
Shell Riverfront Wood River, Illinois (38°50.35'N 090°05.3'W)	3	April 8, 1986	1:6,000	CC	EMSL
Shell Refinery Wood River, Illinois (30°50.3'N 090°04.1'W)	4-12	April 8, 1986	1:6,000	CC	EMSL

†Film type identification:
CC: Conventional color

‡Photo source identification:
EMSL: U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Las Vegas, Nevada.

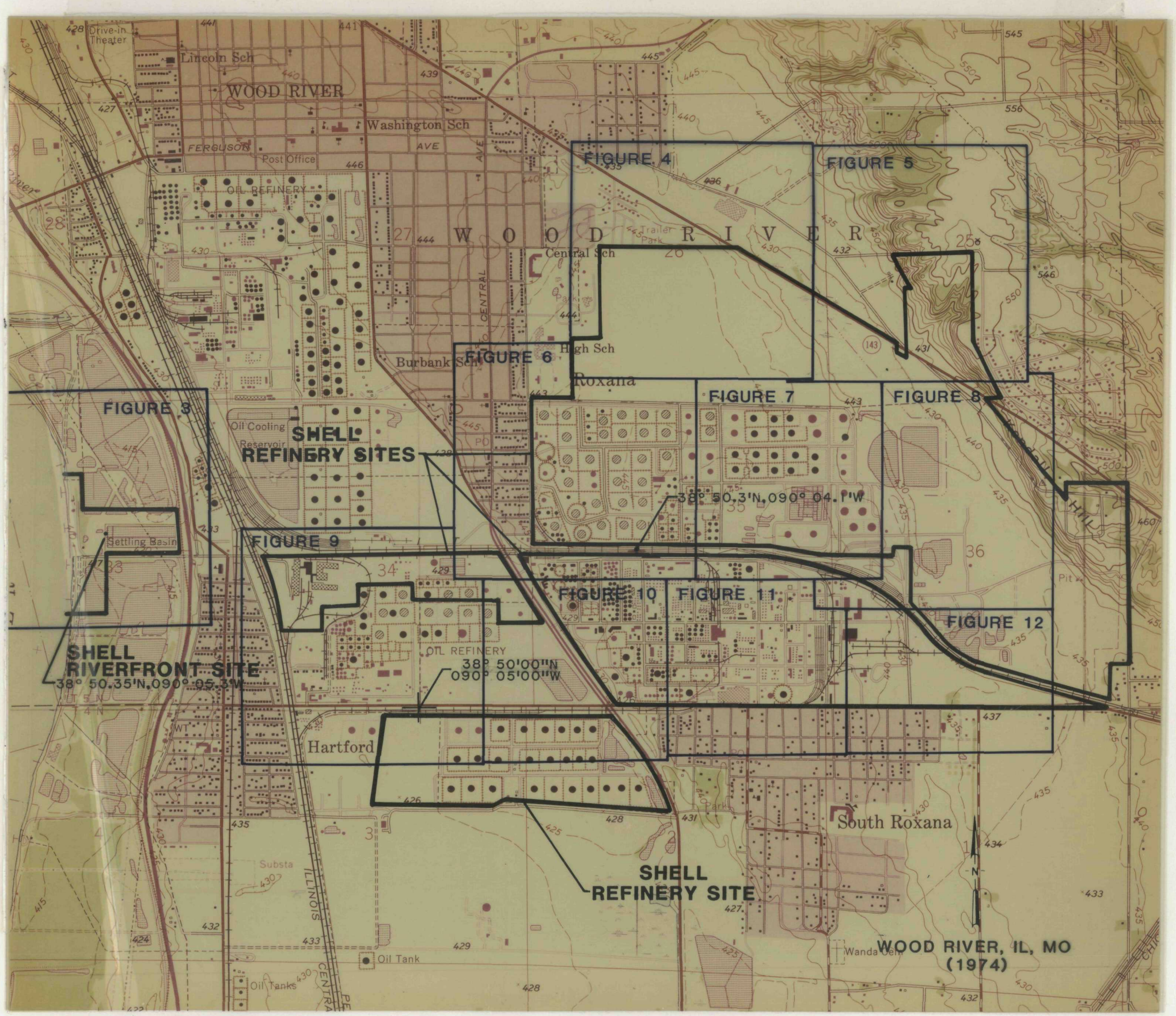

Figure 2. Local site locations, Wood River, Illinois. Scale 1:24,000.

ANALYSIS SUMMARY

The Shell Riverfront and Refinery sites are located on the Mississippi River south of Wood River, Illinois (Figure 2). The sites occupy 60 acres and 1790 acres, respectively. Conventional color aerial photographs acquired on April 8, 1986 were used to perform the analysis.

Terrain at both sites is generally flat with drainage toward the south. Several small drainage channels run south through the Shell Refinery site. The destination of these channels is not visible on the photography. The Shell Riverfront site lies within the inundation zone for a 100-year flood event. Wetland habitats are located within the Riverfront site. Only partial coverage of the Shell Refinery site was obtained.

SHELL RIVERFRONT SITE

The primary feature of this site is a set of four unlined settling basins. Oil loading docks and three storage tanks are also present. No spills, seepage, or sheening is visible at the site.

SHELL REFINERY SITE

Numerous potential contamination sources are present at this site. Extensive waste disposal areas are present at three points within the site . Numerous sludge deposits, landfills, solid waste, unlined lagoons, and pools of unidentified liquid are visible at these. Oil spillage was noted at many points, especially at storage tanks. In the northeast part of the site is an old waste disposal area. Numerous stains, drums, and storage tanks are also noted at the site.

PHOTO ANALYSIS
SHELL RIVERFRONT SITE

APRIL 8, 1986

Figure 3 shows that the site is well fenced. Four oil loading docks are located along the river. No slicks or sheens are evident at any of these docks. Significant features are:

Settling Basins 1-4: All four of the basins contain liquid and appear to be unlined. No seepage is visible.

Three contained storage tanks are present at the site.

Figure 3. Shell Riverfront site, April 8, 1986. Approximate scale 1:6000.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM MOUNDED MATERIAL (SMALL)
- CR CRATES/BOXES
- DR DRUMS
- HT HORIZONTAL TANK
- PT PRESSURE TANK
- VT VERTICAL TANK
- CA CLEARED AREA
- DG DISTURBED GROUND
- FL FILL
- IM IMPOUNDMENT
- LG LAGOON
- OF OUTFALL
- SD SLUDGE
- ST STAIN
- SW SOLID WASTE
- TR TRENCH
- VS VEGETATION STRESS
- WD WASTE DISPOSAL AREA
- WL WETLAND

PHOTO ANALYSIS
SHELL REFINERY SITE

APRIL 8, 1986 (1 of 9)

Figure 4 shows the northern edge of the site. This area consists of agricultural land with no industrial activity or potential contamination sources visible. Drainage in this area is to the south. The site boundary in this area is unfenced.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
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- EXCAVATION, PIT (EXTENSIVE)
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- OF OUTFALL
- SD SLUDGE
- ST STAIN
- SW SOLID WASTE
- TR TRENCH
- VS VEGETATION STRESS
- WD WASTE DISPOSAL AREA
- WL WETLAND

Figure 4. Shell Refinery site, April 8, 1986 (1 of 9). Approximate scale 1:6000.

Most of this section of the site is also agricultural land (Figure 5). A major ephemeral stream flows south through the area. Significant features are:

Old WD: The terrain in this area appears to have been altered and then revegetated. The following features also suggest that the area may have been the scene of waste disposal.

Annotation A: These are two probable leachate breakouts. Dark liquid flowing from these points has not left the site.

Annotation B: These are linear ground scars possibly related to burial trenches.

Additional features are burn areas, and an impoundment. The site boundary in this area is unfenced.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
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- SW SOLID WASTE
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- WD WASTE DISPOSAL AREA
- WL WETLAND

Figure 5. Shell Refinery site, April 8, 1986 (2 of 9). Approximate scale 1:6000.

Figure 6 shows a section of the bulk oil storage area. This area is completely fenced. A major drainage channel runs south through this area. The eventual destination of this channel is not apparent. Significant features are:

+1 and +2: These are heavy, dark oily spills within containment dikes. The adjacent tanks are the likely source but they do not appear to be leaking.

+3: This orange-hued spill is visible both within containment and outside containment dikes. The source of this liquid is not apparent.

ST1: The adjacent tank doesn't appear to be the source of this dark oily stain within containment.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
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- WD WASTE DISPOSAL AREA
- WL WETLAND

Figure 6. Shell Refinery site, April 8, 1986 (3 of 9). Approximate scale 1:6000.

Waste disposal activity is noted near the center of Figure 7. No major drainages cross this part of the site. Significant features are:

+4: Three pools of orange-colored liquid. These pools are within containment. The source is not apparent.

+5: This feature consists of two dark pools of spillage. The source is unknown. These pools lie outside containment.

+6-+8: These are dark oily pools of liquid associated with adjacent vertical tanks. The tank at +8 shows signs of leaking. All of these are within containment.

+9: This is an orange-colored spill outside the containment. The source is not evident.

ST2-ST5: These dark stains within containment are probably old spills.

Annotation C: These are unlined pits. Standing liquid is present in all three of these. Their purpose is not evident.

Inactive Oily IM: An extensive waste disposal area shows a very dark surface, possibly due to disposal of liquid petroleum wastes or sludges.

Annotation D: These are pools of dark liquid associated with the adjacent waste disposal area. They are probably standing water contaminated by material from the waste disposal area or liquid waste.

Figure 7. Shell Refinery site, April 8, 1986 (4 of 9). Approximate scale 1:6000.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
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TRANSPORTATION/UTILITY

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SITE FEATURES

- DIKE
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- WD WASTE DISPOSAL AREA
- WL WETLAND

A second area of waste disposal activity is present on Figure 8. This area is well-fenced. Drainage in this area is to the south and is diverted around the lagoons 1 and 2 into the two ponds. These ponds are vulnerable to contamination from LG1 and LG2 and also leachate from any waste which may have been buried at FL2. Significant features are:

LG1: This unlined lagoon is almost empty at this time.

LG2: This unlined lagoon contains dark oily liquid, probably a petroleum waste.

LG3: This feature consists of a series of six unlined pits. Three of which contain liquid (possibly standing water). A raised road way runs through these pits possibly for dumping from tank trucks.

FL1: This mounded area is probably a landfill. A deposit of solid waste is noted along the southern slope and scattered over the surface.

FL2: Two large sludge deposits are on the north side of this fill area. These are draining into LG2. A trench can also be seen at this area.

+10: These are pools of white liquid which appear to have been dumped on the fill surface.

DR1: A small number of drums are stored at this point. No leakage is visible.

Additional features are a sump near the loading racks. Features located in the WD are discussed on page 26.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
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- EXCAVATION, PIT (EXTENSIVE)
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Figure 8. Shell Refinery site, April 8, 1986 (5 of 9). Approximate scale 1:6000.

APRIL 8, 1986 (6 of 9)

Figure 9 shows the southwest corner of the site. Fencing in this area is adequate. No major drainages are present. Significant features are:

LG4: This unlined lagoon is probably associated with waste water treatment.

+11 and 12: Adjacent tanks are the probable source of these dark oily spills inside containment, although no signs of leakage are observed.

Annotation E: These are dark-black areas south of abandoned buildings. The nature or source of these features is not apparent.

Annotation F: This mound of yellow solid is probably sulfur.

DR2: Approximately 15 drums are at this location. No leakage is visible.

Additional features shown on this frame are skimming and aeration ponds and other waste treatment structures.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
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DRAINAGE

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TRANSPORTATION/UTILITY

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SITE FEATURES

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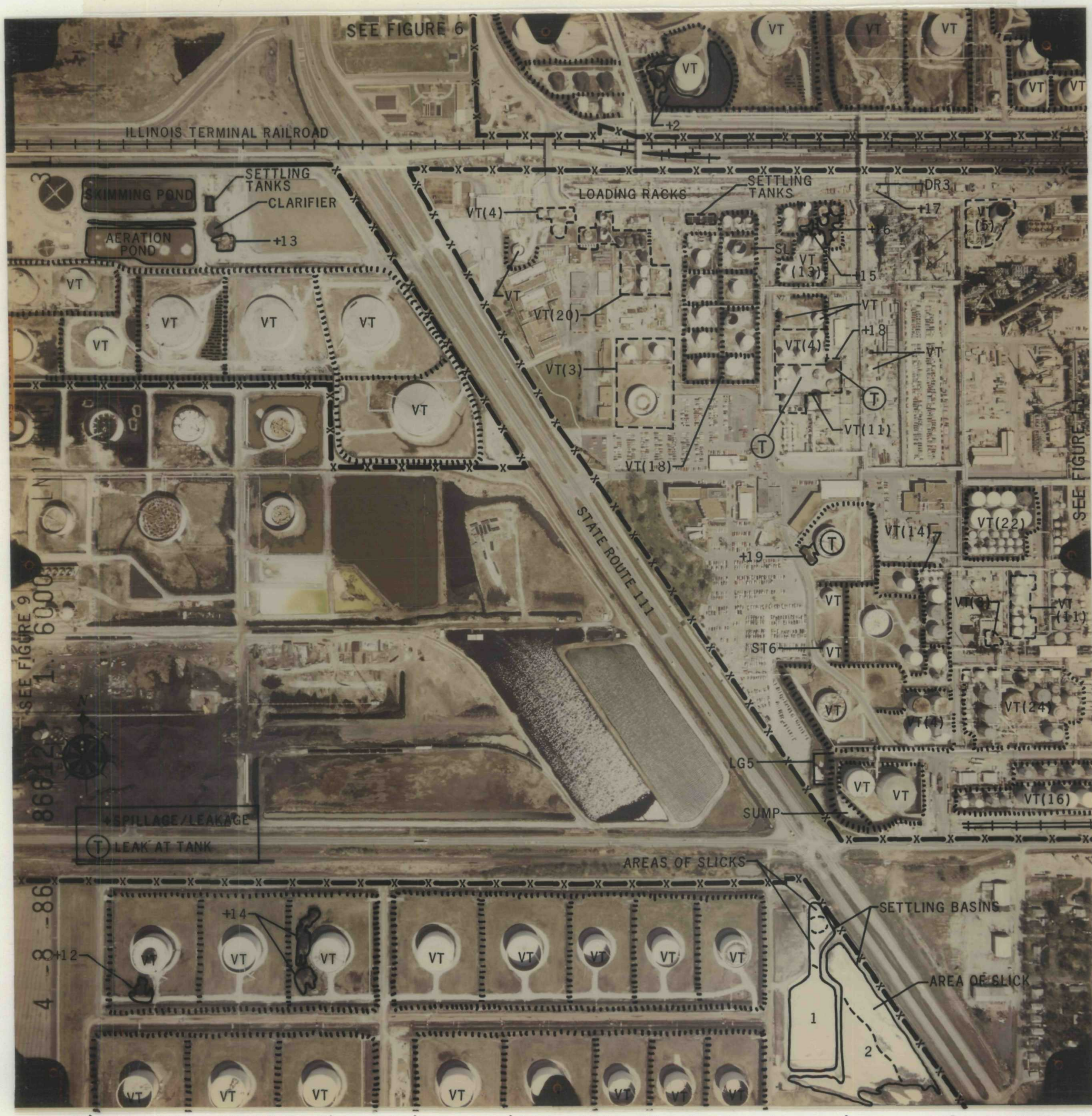
Figure 9. Shell Refinery site, April 8, 1986 (6 of 9). Approximate scale 1:6000.

Figure 10 shows the western section of the primary refining complex. All site areas are well fenced. Drainage channels are visible at two points. Direction of flow is to the south. Significant features are:

LG5:	This is a sump located in a drainage channel. A dark slick is visible within this sump.
+13:	A dark liquid spill from a leaking clarifier is visible at this point.. This liquid is outside containment.
+14:	This dark oily liquid is within containment.
+15 and 16:	These are accumulations of water mixed with oily spillage within containments. Old tanks nearby are a probable source.
+17:	This is a small dark spill originating at the adjacent drums (DR3).
+18 and 19	These are small dark colored spills from adjacent leaking tanks. These spills lie within contained areas.
DR3:	Approximately 12 drums which are a probable source of +17.
ST6:	This is a dark stain probably an old spill from the adjacent tank.
Settling Basins 1-2:	Slicks and sheen are visible on both basins. No discharges are visible. Sun glint obscures some of the detail (see Figure 11).



INTERPRETATION CODE

BOUNDARIES AND LIMITS

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SITE FEATURES

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Figure 10. Shell Refinery site, April 8, 1986 (7 of 9). Approximate scale 1:6000.

Figure 11 shows the central refining complex. Numerous fractionating and cooling towers are present as well as storage and processing tanks. Fencing in this area is complete. Significant features are:

LG6: This small unlined lagoon or sump contains dark liquid.

+20: A set of heavy black spills along railroad tracks is visible at this pont. Extensive spilling from an adjacent pipeline is a possible source.

+21 and +22: These are dark-colored spills originating at adjacent tanks. Spillage at +22 lies outside containment.

+23: This orange-colored liquid is within containment.

ST7: This is a set of two dark-colored stains located below pipelines; however, they do not appear to be the source.

ST8: This is an area of extensive staining at loading racks.

ST9: This is a very heavy area of staining in an open area. The source is not evident.

ST10: This is a dark-colored old spill. The source is not apparent.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
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TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

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- WD WASTE DISPOSAL AREA
- WL WETLAND

Figure 11. Shell Refinery site, April 8, 1986 (8 of 9). Approximate scale 1:6000.

An extensive waste disposal area is located along the eastern edge of the site. Numerous potential contamination sources exist within this area. Fencing is complete within this area. Significant features are:

LG7:	This is an unlined sludge lagoon.
SD:	Eight extensive deposits of black oily sludge or tar have been dumped or spread into the soil.
FL3:	This fill area is probably a small landfill. Solid waste is present and a pool of dark liquid lying below the area may have been contaminated by material from the landfill.
FL4:	This is possibly an old landfill; however, no solid waste is visible.
Annotation G:	Numerous tanks are stored along a drainage ditch in this area. Several multicolored spill stains can be seen leading into the channel. Unidentified cylindrical objects are also visible in the ditch.
Annotation H:	These are pools of standing liquid showing sheen and discoloration suggesting oil contamination located within an old breached containment.
DR4:	Numerous drums in good condition are stored at this point.
DR5:	A small number of drums (approximately 30) are visible.
ST11:	This is an extensive black stain or dust. The source is not evident.
ST12:	This stain consists of two dark areas, possibly dust in open storage areas.
ST13-ST14:	These are medium-toned stains in the waste disposal area probably from old spills or liquid waste dumping.

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- XXXXXX FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
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TRANSPORTATION/UTILITY

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SITE FEATURES

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- STANDING LIQUID
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Figure 12. Shell Refinery site, April 8, 1986 (9 of 9). Approximate scale 1:6000.

OCTOBER 1977 FLOOD MAP

Figure 13 shows the relationship between the riverfront and refinery sites in relation to the inundation boundary of a 100-year flood event on the Mississippi River. The riverfront site lies west of the levee at an elevation of 420 feet and would be covered by 100-year flood. The refinery site is protected by the levee and would not be flooded unless breaches in the levee were to occur.

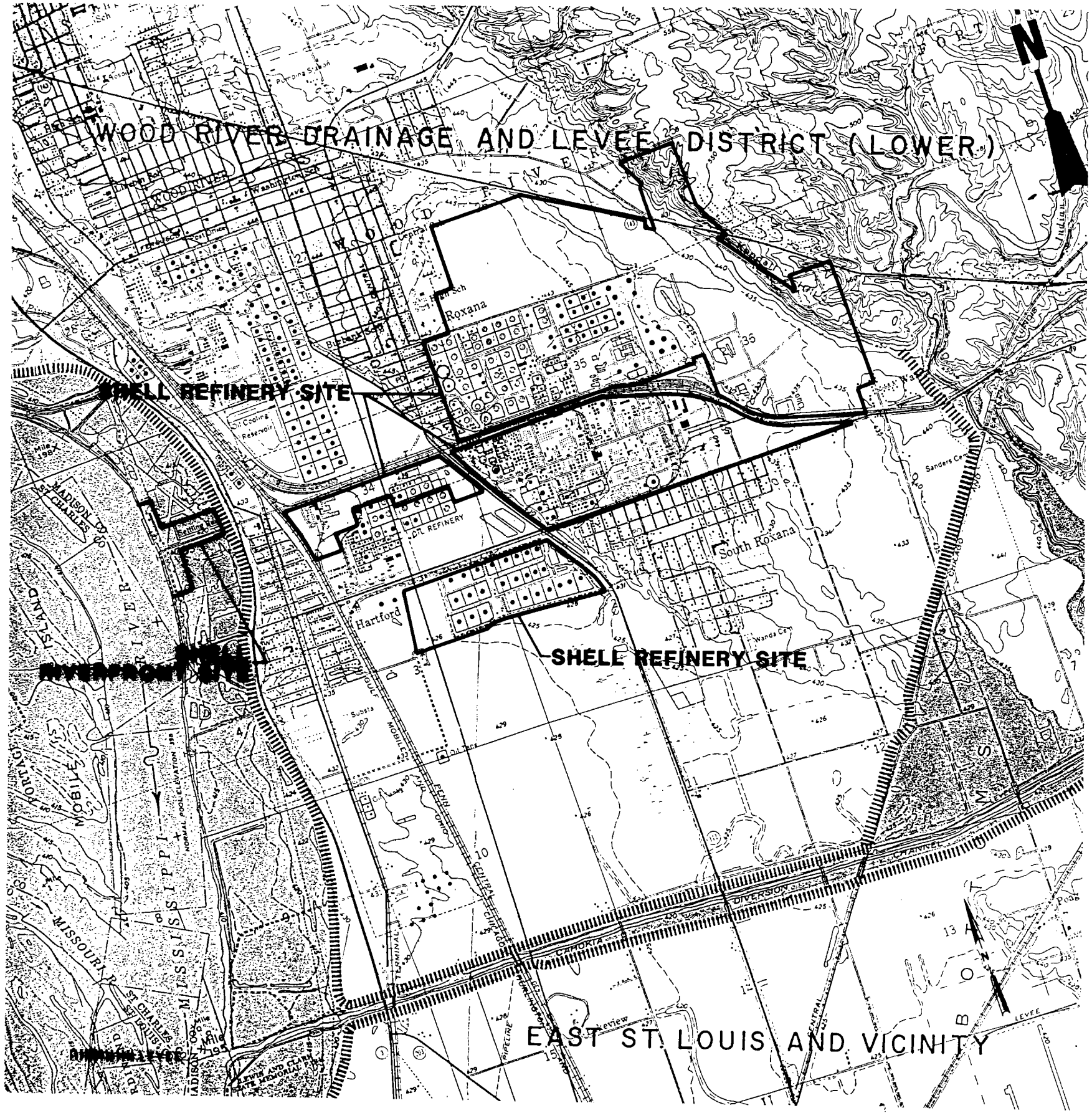

Figure 13. Flood Hazard Study Map, October, 1977. Scale 1:40,000.